

# **Benchmarking**

## Experience and Perspectives

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# Benchmarking as Practiced

- Whole building, as-billed energy consumption, “peer- group” comparison
- About 55 percent of the commercial marketplace
  - Office, K-12, supermarkets, hospital, hospitality, courthouses, branch banks, warehouses, resident halls/dormitories, medical office buildings
- Ratings take into account...
  - Building type and size
  - Climate and weather (i.e., location and El Nino effects)
  - Weekly hours of occupation
  - Number of Occupants
  - Fuel type (i.e., source energy)
  - Other parameters (e.g., upscale vs midscale hotel, presence of food preparation within grocery stores or hotels, on-sight parking garage...)
- Mixed-use space, Mixed-use operating hours
  - e.g., Office and warehouse may be benchmarked as a mixed-use building
  - e.g., K-12 with nighttime classes may be divided into segments with unique operating hours
- Ability to benchmark over time
  - Building information is date stamped
  - e.g., Rating remains relevant over time even as floor area and hours change

# **CBECS**

## Commercial Building Energy Consumption Survey

- Energy Information Administration (EIA/DOE)
- CBECS survey has occurred eight times since 1979
- Sample size ~5,500 nationwide, ~850 in California
- CBECS has sufficient data resolution for benchmarking
  - i.e., building type and size, energy for all fuel types, hours, # PCs...
- Hospital and hospitality are currently based on industry supplied data

# Timeline: Historical Development

- 1995** Recognized that technology did not tell the whole story
  - Commissioning was becoming a growing focus
  - Began offering partners simple energy intensity (EUI) comparisons
- 1997** PECO Conference, Huntington Beach, CA
  - Informal sharing of ideas (Oak Ridge Labs, DOE, NRDC, PECO, LBNL...)
  - Two basic approaches: “better than code” and “as-billed benchmarking”
- 1997** Began pursuing “better than code” with PNNL grant
  - Later decided the market needed something different
- 1997** Began talking with past “BEPS” contacts
  - Realized the BEPS was not in a condition that could be used
- 1998** ACEEE Summer Study
  - Oak Ridge National Laboratory presented “benchmarking” paper using EIA/DOE data
  - EIA/DOE staff were in attendance as well
- 1999** Released benchmarking for office buildings using 1995 CBECS data

# Timeline: Recent Updates

**2001** Updated to 1999 CBECS, expanded to include K-12

**2002** Improved handling of climate data and added K-12 energy use for pools at suggestion and assistance of LBNL

**2001, 2002** Introduced hospital and hospitality

**2002** Modified weather normalization routines

- Grant with Dayton U. to better handle anomalous data situations

**2004** Introduced other building types previously listed

**2004** Re-tooled Portfolio Manager

- **Default values**
  - User minimally must provide energy data and floor area
- **Bulk energy data transfer**
  - “XML” technology to facilitate bulk data transfer
  - Dedicated server
- **Ability to group buildings, share data between accounts**

# Timeline: Future Maintenance

## As soon as 2003 data is available

- Update all benchmarks using 2003 data
- Split K-12 into Elementary/Middle and High School
  - Grant to EIA since 2002
- Expand to retail buildings (coverage to ~70%)
  - Grant to EIA since 2002
- Investigate inclusion of weighting factors
- Investigate additional factors for climate effects
- Expand benchmarking to 100% coverage with “other” category

## As soon as practical

- Provide regionalized information (partly at NYSERDA’s request)
  - Option 1:** Users dynamically compare themselves to other users
- **Option 2:** NYSERDA, CEC... summarize user data as they see fit with summary statistics, plots, messaging
- Option 3:** Inclusion of other statistical datasets

# Example Screen in Portfolio Manager

Emphasis on improvement

QA/AC trapping

Rating as it appears when using defaults

Portfolio Manager - Building list - Microsoft Internet Explorer

Welcome: Bob Rose

Average Rating for All Facilities:  
Baseline Rating: N/A Current Rating: 74  
Average Ratings are weighted by Total Floor Space. Only facilities with a Rating are included. [More about Ratings](#)

Summarized below are the facilities in your account. Groups and Views are provided below to help you customize the way in which you view your Portfolio. To improve system performance, users are strongly encouraged to create multiple Groups to help manage large Portfolios of facilities. **Select a facility to view or add more detailed information about it.**

[Add Facility](#) | [ENERGY STAR Leaders](#) | [Share Facilities](#) [Download this View in Excel](#)

GROUP: All Facilities Create Group View All VIEW: Status Create View Edit View View All

Results 1 - 3 of 3

Facility Name	Total Floor Space (Sq. Ft.)	Actual Annual Energy Intensity (kBtu/Sq. Ft.)	Energy Use Alerts	Period Ending	Full Year	Last Modified
<a href="#">Refrigerated Warehouse</a>	100,000	92.0	100%	12/31/2004	Yes	04/01/2005
<a href="#">test</a>	0	0.0	100%	Must Have Electrical Data	No	03/15/2005
<a href="#">Test Object w/ Defaults</a>	100,000	45.0	74**	Data > 120 days old	Yes	04/01/2005

Results 1 - 3 of 3

\*\* This rating has been calculated using Default values for one or more Space Attributes. Ratings using Defaults are not used when calculating Average Rating for the Portfolio. The rating is calculated by using the last day of the latest full calendar month where all meters in the facility have meter entries; the Period Ending date reflects that particular date.

# In EPA's Experience...

- ...the focus is portfolio-wide energy improvements
- ...benchmarking is effective within an overall context
- ...end-users value the simplicity of a *portable, non-engineering, normalized* (e.g., floor area, hours, occupants) metric that facilitates communication upward and downward in the organization
- ...many end-users value the ability of weather adjustments alone

EPA is programmatically moving towards continual improvement across portfolios of buildings, via the “score” as a normalizing measure.



# Users Like Having a Standard

## **The ENERGY STAR Challenge –**

Build a Better World 10% at a Time

- American Hotel & Lodging Association (AH&LA)
- American Society for Healthcare Engineering of the American Hospital Association (ASHE)
- Association of School Business Officials International (ASBO)
- Building Owners and Managers Association (BOMA)
- California State Teachers' Retirement System (CalSTRS)
- Council of Educational Facility Planners International (CEFPI)
- Delaware
- Efficiency Vermont
- Food Marketing Institute (FMI)
- Institute for Sustainable Energy
- Maine
- National Association of Counties (NACo)
- National Association of Energy Service Companies (NAESCO)
- National Association of State Energy Officials (NASEO)
- New Hampshire
- New York State Energy Research and Development Authority (NYSERDA)
- Ohio
- Pennsylvania
- Public Technology Institute
- Real Estate Roundtable
- SACIA-The Business Council of Fairfield County, Connecticut
- US Telecomm Association (USTA)

## **ENERGY STAR Leaders**

EPA designates Leaders based on documented improvement in EPA's energy performance rating system.

- Colorado Springs School District 11-Colorado Springs, CO
- The Vanguard Group-Valley Forge, PA
- Cambridge Savings Bank-Cambridge, MA
- Cambridge Savings Bank-Cambridge, MA
- Columbus Hospitality-Columbus, OH
- Food Lion-Salisbury, NC
- Giant Eagle-Pittsburgh, PA
- Granite Properties-Plano, TX
- HE Butt Grocery Company-San Antonio, TX
- USAA Real Estate Company-San Antonio, TX
- Completing the portfolio-wide baseline
- Academy School District 20-Colorado Springs, CO
- Douglas, Emmett & Company-Los Angeles, CA
- Glenborough Realty Trust, Inc.-San Mateo, CA
- The Hartford-Hartford, CT
- Muskogee Public Schools-Muskogee, OK
- New York Presbyterian Hospital-New York, NY
- Parkway Properties-Jackson, MS
- Saunders Hotel Group-Boston, MA
- The World Bank-Washington, DC

# Portfolio Management/Tracking is Taking Hold

- CalSTRS' policy is that all office real estate holdings benchmark performance monthly on the ENERGY STAR rating
- CalPRS is considering that all real estate holdings benchmark on the ENERGY STAR rating even if a benchmark is not available simply for the normalization aspects
- Transwestern Commercial Services (real estate firm) has utilized a “PE verified” score as part of commercial real estate transactions
- Arden Reality Inc.'s 100 W. Broadway, Long Beach property has continuously improved since 1999 to 2004 from a score of 77 to a 98
- USAA Real Estate Company relies on EPA's benchmarking for monthly reporting to “*objectively track and measure performance over time*” (average corporate score = 82)

## In EPA's Experience...

- A simple energy intensity metric (energy per floor area) will not be accepted by end-users
- Six years ago, EPA was criticized for creating a rating that only took into account annual energy, floor area, hours, occupants, #PCs, climate, weather...
- Developing and maintaining a benchmarking system is a process and takes years to gain acceptance

# California Buildings

## CEUS (California Energy Use Survey)

- Average scores are significantly above 50
- 50 is deemed to be the national average
- It appears about 45 percent of CA buildings would qualify for ENERGY STAR today

### Review of National and California Benchmarking Methods

Nance Matson and Mary Ann Piette

Lawrence Berkeley National Laboratory

March 18, 2005

DRAFT

Table 1: Summary Statistics

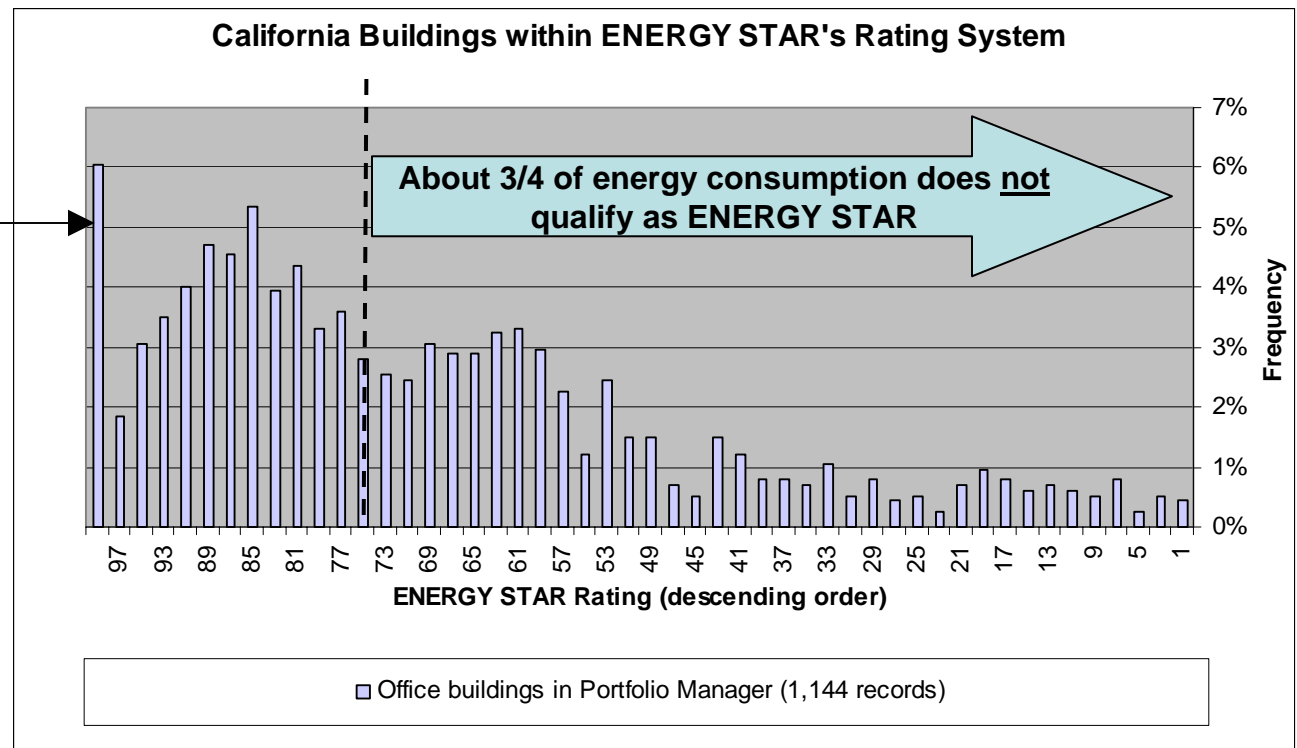
Building Type	N	Un-weighted Average Rating		Floor-Area Weighted Average Rating		Percent of buildings with 75+ rating	
		Earlier Model	Current Model	Earlier Model	Current Model	Earlier Model	Current Model
K-12 Schools – Same Inputs as Earlier Model	32	75 ±24	67 ±25.6	61	63	69%	56%
Offices	109	-	61 ±28.3	-	68	-	43%
Offices Subset – Same Inputs as Earlier Model	54	65 ±25.5	66 ±25.2	70	69	48%	46%
Hotels	18	-	76 ±30.1	-	45	-	82%
Medical Offices	5	-	51 ±6.8	-	51	-	0%
Supermarkets	16	-	52 ±32.5	-	62	-	38%
Warehouses	44	-	46 ±33.8	-	40	-	27%
All Buildings	224	-	59 ±30.2	-	60	-	42%

# California Office Buildings

## Within Portfolio Manager

- 1,800 CA buildings have enough data to receive a rating (out of 3,300)
- 1,144 are office buildings
- Average score below is 68

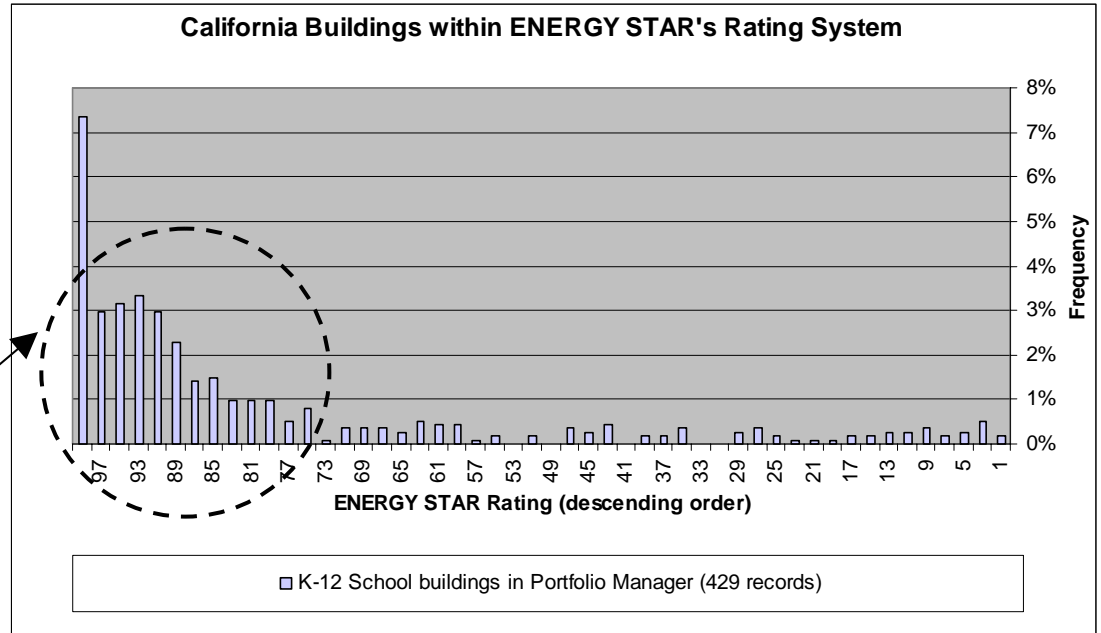
Some of the 100 ratings likely represent missing energy data.



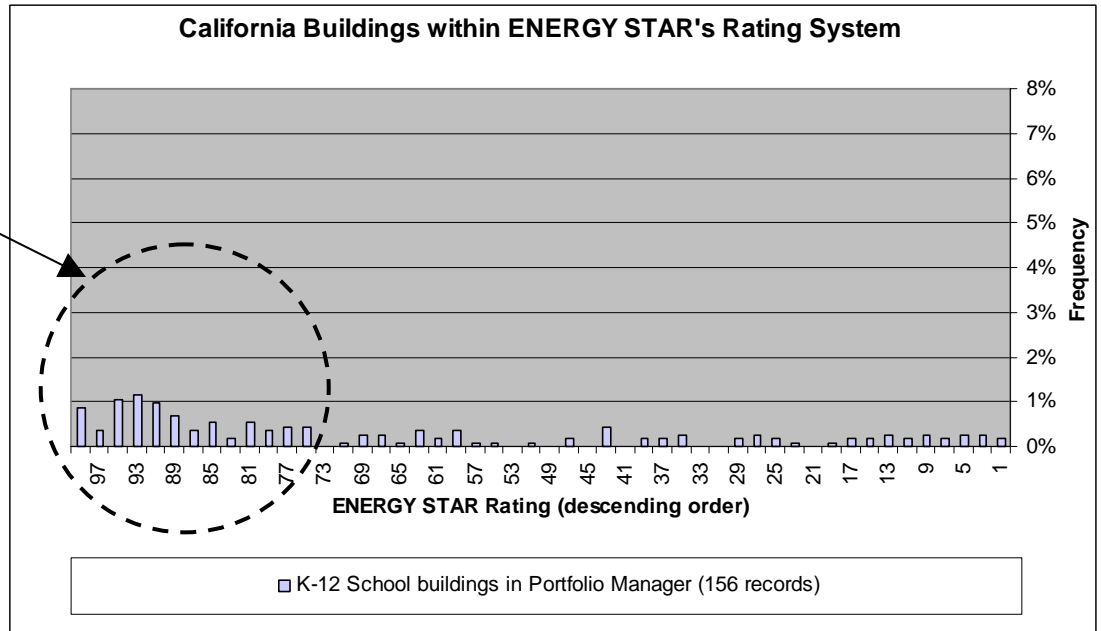
# California K-12 Buildings Within Portfolio Manager

427 K-12 schools in Portfolio Manager have enough data to receive a rating.

Including San Diego and Fremont



Excluding San Diego and Fremont

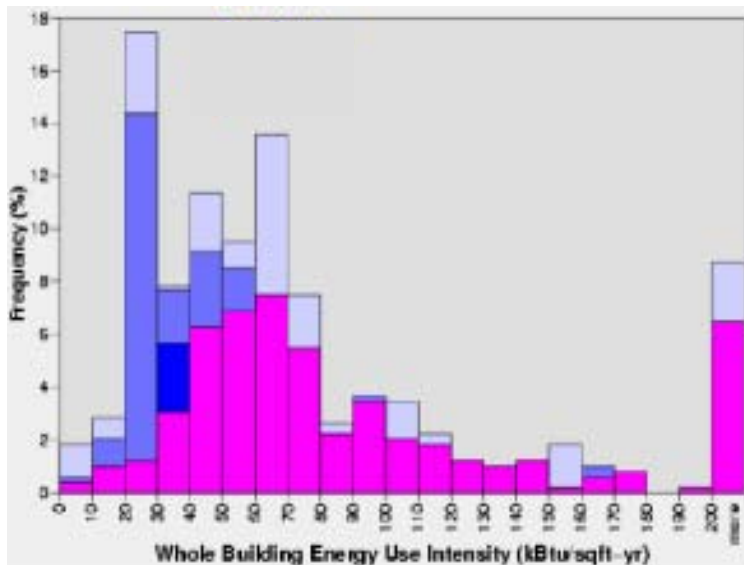


# ENERGY STAR in California

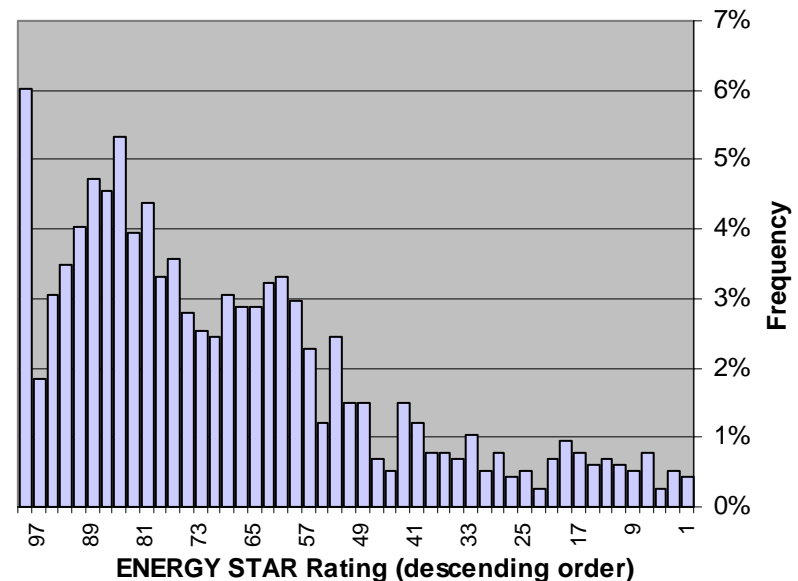
- EPA does not dispute the existence of high scores in California
- EPA believes end-users will respond no differently to either plot below

EPA's view is that CEC is in a position to **establish expectations** (e.g., higher scores) **and goals** within the context of a national benchmark.

Representative CEUS Plot



CA Office Buildings on ENERGY STAR Scale



# Working Together

- 1) CEC could help EPA access higher resolution HDD/CDD data mapped into CA zip codes
- 2) EPA and CEC should keep in close contact when the new CBECS and CUES data becomes available
- 3) EPA will actively keep the market transformation community up to date prior to the next round of updates
- 4) EPA would like to entertain regional information for end-users
- 5) Working together to promote portfolio approach and continuous improvement
- 6) Utility data sharing